REMARKS

An excess claim fee payment letter is submitted herewith to cover the cost of the added claim.

Claims 1-22 are all the claims presently pending in the application. Claims 1-21 have been amended to more particularly define the invention. Claim 22 has been added to claim additional features of the invention. Attached hereto is a marked-up version of the changes made to the specification and claims by the current Amendment.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability.

Claims 1-13 and 21 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Song (U.S. Pat. 6,091,464). Claims 14-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Song.

These rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

The claimed invention is directed to a liquid-crystal display device and method of forming the device. The inventive device includes a plurality of address wirings formed on an insulating substrate, a gate insulating film formed on the address wirings, a plurality of data wirings, the data wirings crossing the address wirings, an upper layer insulating film grown on the data wirings, and a picture element area which includes a transparent electrode including transparent conductive film, formed on the upper layer insulating film and surrounded by the address wirings and the data wirings, a thin-film transistor section for selectively connecting the data wirings with the transparent electrode by a gate connected to the address wirings, and a capacitor section including a first electrode formed on the gate insulating film and including the same conductive film as in the data wirings, and a second electrode formed on the upper layer insulating film and including the same transparent conductive film as in the transparent electrode, at least a portion of the upper layer insulating

film being formed between the first electrode and the second electrode.

Conventional liquid crystal display devices form a capacitor section using an auxiliary capacitive common electrode, a gate insulating film, and a storage electrode. However, in this case the thickness of the dielectric layer and dielectric constant are limited, and an area of the electrode is increased if electrostatic capacity must be increased. As a result, the display is poorly lit and power consumption is increased.

The claimed device, on the other hand, includes a capacitor section including a first electrode formed on the gate insulating film and including the same conductive film as in the data wirings, and a second electrode formed on the upper layer insulating film and including the same transparent conductive film as in the transparent electrode, at least a portion of the upper layer insulating film being formed between the first electrode and the second electrode. With this feature, the material and thickness of the upper layer insulating film can be selected independently of the gate insulating film and by adjusting the thickness or dielectric constant of the upper layer insulating film, the capacitor section having a desired electrostatic capacitance can be formed without extension of the area.

II. THE SONG REFERENCE

The Examiner alleges that Song teaches the claimed invention. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Song.

Song discloses an LCD device which includes a transparent insulation substrate, a plurality of scan lines and data lines perpendicularly crossing each other on the substrate, a metal segment layer overlapping the scan line, a pixel electrode formed at the area surrounded by two neighboring scan lines and two neighboring data lines for contacting with the metal segment, and a switching element electrically connected with the pixel electrode, the scan line and the data line. The Song LCD is intended to be capable of preventing electrical shorts between neighboring pixel electrodes and the liquid crystal display (Song at Abstract).

However, contrary to the Examiner's allegations, Song does not teach or suggest "a capacitor section comprising a first electrode formed on said gate insulating film and comprising the same conductive film as in said data wiring, and a second electrode formed on

said upper layer insulating film and comprising the same transparent conductive film as in said transparent electrode, said upper layer insulating film being formed between said first electrode and said second electrode" as recited in claim 1. Likewise, Song does not teach or suggest "forming said capacitor section using said first electrode, said second electrode, and said upper layer insulating film" as recited in claim 14 and similarly recited in claims 18 and 20.

As noted above, conventional liquid crystal display devices form a capacitor section using an auxiliary capacitive common electrode 41, a gate insulating film 5, and a storage electrode 42 (Application at page 7, lines 21-24; Figure 33). However, in this case, the thickness of the dielectric layer and dielectric constant are limited, and an area of the electrode is increased if electrostatic capacity must be increased (Application at page 7, lines 24-28). As a result, the display is poorly lit and power consumption is increased (Application at page 7, line 28-page 8, line 3).

The claimed device, on the other hand, includes a capacitor section including a first electrode formed on the gate insulating film and including the same conductive film as in the data wirings, and a second electrode formed on the upper layer insulating film and including the same transparent conductive film as in the transparent electrode, at least a portion of the upper layer insulating film being formed between the first electrode and the second electrode (Application at page 9, lines 4-10; page 24, lines 13-17; Figure 2). With this feature, the material and thickness of the upper layer insulating film can be selected independently of the gate insulating film and by adjusting the thickness or dielectric constant of the upper layer insulating film, the capacitor section having a desired electrostatic capacitance can be formed without extension of the area (Application at page 9, lines 13-18).

For instance, referring to Figure 2, the Application describes an exemplary embodiment stating:

> "[i]n the capacitor section 105, since the dielectric layer (the upper layer insulating film 8) between electrodes is composed of the silicon nitride film having its film thickness being smaller than that of the gate insulating film 5 and having a high dielectric constant, electrostatic capacitance per area is made larger when compared with that in the conventional liquid-crystal

display device employing the gate insulating film 5 as the dielectric layer" (Application at page 24, lines 18-25).

Clearly, Song does not teach or suggest these novel features. The Examiner apparently equates the metal segment 150 with the first electrode in the capacitor section of the claimed invention. However, this is clearly unreasonable. Indeed, the Examiner appears to have arbitrary selected two overlapping metal structures in the Song device and identified these structures as forming the electrodes of a capacitor. Applicant notes that nowhere does Song identify any structure in his LCD as forming a "capacitor". Applicant respectfully submits that this is at least indicative of the fact that such an element is missing from the Song device.

As shown in Figure 2 of the Application, the capacitor section 105 of the claimed invention, may include a first electrode 10 (including the same conductive film as in the data wiring), and a second electrode 25 (including the same transparent conductive film as in the transparent electrode). Further, at least a portion of an upper insulating layer 8 is formed between these two electrodes.

In Song, on the other hand, the metal segment 150 is in contact with the pixel electrode 130a. In other words, there is no dielectric formed between these metal structures. Therefore, no person of ordinary skill in the are would confuse these structures as forming a capacitor element.

Moreover, the Examiner apparently concludes that since the metal segment150 may be formed in a same step as forming data line 120, the metal segment 150 must be equivalent to the first electrode of the claimed invention. However, the metal segment 150 is clearly not intended to act as an electrode in a capacitor section. Indeed, Song clearly states that the metal segment 150 is intended "preferably for maintaining the aperture ratio of the LCD" (Song at col. 3, lines 40-46). Therefore, whether the metal segment 150 may be formed in the same step as the data line 120 is irrelevant.

Therefore, there are elements of the claimed invention that are not taught or suggested by Song. Therefore, the Examiner is respectfully requested to withdraw this rejection.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1-22, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claim 22 was added.

The claims were amended as follows:

1. (Amended) A liquid-crystal display device comprising:

a plurality of address wirings formed on an insulating substrate;

a gate insulating film formed on said address wirings;

a plurality of data wirings, [formed in a manner that] said data wirings crossing [and] said address wirings [cross each other];

an upper layer insulating film grown on said data wirings; and

a picture element area comprising:

a transparent electrode, comprising [composed of] a transparent conductive film, formed on said upper layer insulating film and [placed in each of picture element areas] surrounded by said address wirings and said data wirings;

a thin-film transistor section for [, disposed in each of picture element areas, used to] selectively connecting [connect] said data wirings with said transparent electrode by a gate connected to said address wirings; and

a capacitor section [, disposed in each of picture element areas,] comprising [composed of] a first electrode formed on said gate insulating film and comprising [using] the same conductive film as in [used for] said data wirings, a second electrode formed on said upper layer insulating film and comprising [using] the same transparent conductive film as in [used for] said transparent electrode, and at least a portion of [and] said upper layer insulating film being formed between said first electrode and said second electrode.

2. (Amended) The liquid-crystal display device according to claim 1, wherein said second electrode comprises [is formed with] an extended part of said transparent electrode.

3. (Amended) The liquid-crystal display device according to claim 1, wherein said first electrode is connected to said address wirings by [using] the same transparent conductive film

as used for said transparent electrode.

4. (Amended) The liquid-crystal display device according to claim 1, wherein said first electrode is connected to said address wirings by [using] the same conductive film as in [used for] said data wirings.

5. (Amended) The liquid-crystal display device according to claim 1, wherein a part of said capacitor section is [formed in a manner that it is] superimposed through said gate insulating film on said address wirings.

6. (Amended) The liquid-crystal display device according to claim 1, wherein a width of said address wirings is constant in said picture element area and wherein said capacitor section is entirely [formed in a manner that the whole of it is] superimposed through said gate insulating film on said address wirings.

7. (Amended) The liquid-crystal display device according to claim 1, wherein [the whole of] said thin-film transistor section and said [of] data wirings are [is] covered with one of said upper layer insulating film and [or] said transparent conductive film.

8. (Amended) The liquid-crystal display device according to claim 1, wherein one of said upper layer insulating film has a thickness which is less than a thickness [is thinner than that] of said gate insulating film, and [or] a dielectric constant of said upper layer insulating film is greater [larger] than a dielectric constant [that] of said gate insulating film.

9. (Amended) The liquid-crystal display device according to claim 1, wherein said upper layer insulating film comprises [is] a complex film comprising [composed of] a plurality of insulating films.

10. (Amended) The liquid-crystal display device according to claim 1, wherein said upper layer insulating film comprises [is composed of,] at least [,] one [kind] of a silicon nitride

film, silicon oxide film and metal oxide film.

11. (Amended) The liquid-crystal display device according to claim 1, wherein an [said] auxiliary capacitive common wiring is formed in parallel with [to] said address wirings and wherein said capacitor section is one of [formed in a manner that it is] partially and [or] totally superimposed on said auxiliary capacitive common wiring.

12. (Amended) The liquid-crystal display device according to claim 11, wherein at least two connections are made [at, at least, two points] between said first electrode and said address wirings or between said first electrode and said auxiliary capacitive common wiring.

13. (Amended) The liquid-crystal display device according to claim 1, wherein said capacitor section is formed by connecting, in parallel, a first capacitive component comprising [composed of] a part of said address wirings, said first electrode and said gate insulating film being located [put] between said address wirings and said first electrode with a second capacitive component comprising [composed of] said first electrode, said second electrode and said upper layer insulating film being located [put] between said first electrode and said second electrode.

14. (Amended) A method for producing the liquid-crystal display device of claim 1, comprising [the steps of]:

forming a plurality of address wirings on an insulating substrate;

forming a gate insulating film on said address wirings;

forming a plurality of data wiring on said gate insulating film, so [in a manner] that said data wirings and said address wirings cross each other;

forming a thin-film transistor for [used to] selectively connecting [connect] said data wirings with said transparent electrode disposed in each [of] picture element area [areas] by a gate connected to said address wirings, in each [of] picture element area [areas] surrounded by said address wirings and data wirings;

forming a first electrode using the same conductive film as used to form [for] said

data wirings;

forming an upper layer insulating film on said first electrode;

forming a second electrode using the same transparent conductive film as used to form [for] said transparent electrode; and

forming said capacitor section using said first electrode, said second electrode, and said upper layer insulating film.

15. (Amended) The method for producing the liquid-crystal display device according to claim 1, wherein said second electrode comprises [is formed with] an extended part of said transparent electrode in said capacitor section.

16. (Amended) The method for producing the liquid-crystal display device according to claim 14, wherein said first electrode is connected to said address wirings by [using] the same transparent conductive film as in [used for] said transparent electrode.

17. (Amended) The method for producing the liquid-crystal display device according to claim 14, wherein said first electrode is connected to said address wirings by [using] the same conductive film as in [used for] said data wirings.

18. (Amended) A method for producing the liquid-crystal display device of claim 11, comprising [the steps of]:

forming a plurality of address wirings on an insulating substrate;

forming a plurality of auxiliary capacitive common wiring [in a manner that it is disposed in] parallel with [to] said address wirings;

forming a gate insulating film on said auxiliary capacitive common wiring;

forming a plurality of data wirings on said gate insulating film, so [in a manner] that said address wirings and data wirings cross each other;

forming a thin-film transistor for [used to] selectively connecting [connect] said data wirings with said transparent electrode [disposed] in each [of] picture element area [areas] by a gate connected to said address wirings, in each [of] picture element area [areas] surrounded

by said address wirings and data wirings;

forming said first electrode using the same conductive film as used to form [for] said data wirings;

forming said upper insulating film on said first electrode;

forming said second electrode using the same transparent conductive film as used to form [for] said transparent electrode; and

forming said capacitor section using said first electrode, said second electrode and said upper layer insulating film so [in a manner] that said capacitor is one of partially and [or] totally superimposed on said auxiliary capacitive common wiring.

19. (Amended) The method for producing a [the] liquid-crystal display device of claim 14, wherein said first electrode is connected to said transparent electrode and said second electrode is connected to said address wirings and wherein said capacitor section is mounted so [in a manner] that it is superimposed on a part of said address wirings.

20. (Amended) A method for producing the liquid-crystal display device of claim 4, comprising [the steps of]:

forming a plurality of address wirings on an insulating substrate;

forming a gate insulating film on said address wirings;

forming, in said gate insulating film, a through hole which extends to [reaches] said address wirings;

forming a plurality of data wirings on said gate insulating film so [in a manner] that said address wirings and data wirings cross each other;

forming a thin-film transistor for [used to] selectively connecting [connect] said data wirings with said transparent electrode [disposed] in each [of] picture element area [areas] by a gate connected to said address wirings, in each [of] picture element area [areas] surrounded by said address wirings and data wirings;

forming said first electrode using the same conductive film used to form [for] said data wirings;

connecting said first electrode to said address wirings via said through hole formed in

said gate insulating film;

forming said upper layer insulating film on said first electrode;

forming said second electrode using the same transparent conductive film [as] used to form [for] said transparent electrode; and

forming said capacitor section using said first electrode, said second electrode and said upper layer insulating film.

21. The liquid-crystal display device of claim 13, wherein said first electrode is connected to said transparent electrode and said second electrode is connected to said address wirings and wherein said capacitor section is mounted so [in a manner] that it is superimposed on a part of said address wirings.